CLAIMS

1. A **cubic logic toy** which has the shape of a normal geometric solid, substantially cubic, which has **N** layers per each direction of the three–dimensional, rectangular Cartesian coordinate system, whose centre coincides with the geometric centre of the solid, said layers consisting of smaller separate pieces, the sides of said pieces which form part of the solid's external surface being substantially planar, said pieces being able to rotate in layers around the rectangular coordinate axes which pass through the centre of the solid's external surfaces and are vertical to said external surfaces, the visible surfaces of said pieces being coloured or bearing shapes or letters or numbers, **said cubic logic toy being characterised by the fact that:**

for the configuration of the internal surfaces of all the separate smaller pieces of the solid, apart from the required planar surfaces and the required concentric spherical surfaces whose centre coincides with the geometric centre of the solid, a minimum number of $\underline{\kappa}$ right conical surfaces per semi-axis of said Cartesian coordinate system are used, the axis of said right conical surfaces coinciding with the corresponding semi-axis of said Cartesian coordinate system

and for the first and innermost conical surface, if its apex coincides with the solid's geometric centre, the generating angle φ_1 is greater than 54,73561032°and if its apex moves to the negative part of the semi-axes the generating angle can be slightly less than 54,73561032°, whereas for the following conical surfaces their generating angles are gradually increased, $\varphi_\kappa > \varphi_{\kappa-1} > \ldots > \varphi_1$, so that when $N=2\kappa$ the resultant solid has an even number of N visible to the user layers per direction, plus one additional layer, the intermediate layer in each direction, which is not visible to the toy user, whereas when $N=2\kappa+1$, then the resultant solid has an odd number of N layers per direction, all visible to the toy user,

the use of said conical surfaces constituting the innovation and the improvement in this toy construction, and resulting in the fact that all the smaller separate pieces which form the final solid are self-contained, extend to the appropriate depth in the interior of the solid, depending on their position and the layer they belong to, each of said pieces consisting of three discernible separate parts of which

the first part, which lies towards the solid's surface is substantially cubic and is spherically cut when it is not visible to the user, the intermediate second part has a conical sphenoid shape, pointing substantially towards the geometric centre of the solid, its cross-section, when sectioned by spheres concentric with the geometric centre of the solid, being either

similar in shape along the entire length of said conical sphenoid part, or different from part to part of its length, said cross-sections' shape, however, being either that of an equilateral spherical triangle or that of an isosceles spherical trapezium or that of a spherical quadrilateral or, more precisely, that of any triangle or trapezium or quadrilateral on a sphere, the faces of said intermediate conical sphenoid part being delimited either by conical or spherical or planar surfaces, and the innermost third part of each piece is a part of a sphere or of a spherical shell delimited appropriately by planar and conical surfaces, said third part being delimited by a cylindrical surface only when it comes to the six caps of the solid, the shaping of said smaller separate pieces being such as to create on them recesses – protrusions, whereby each piece is intercoupled and supported by its neighbouring pieces, said recesses – protrusions being such as to create, at the same time, general spherical recesses - protrusions between adjacent layers, the maximum number of said spherical recesses - protrusions being two, when the stability of the construction requires it, in this latter case the number of the concentric spherical surfaces as well as of the conical surfaces being increased as necessary, said recesses – protrusions on the one hand protecting the separate pieces and the layers from being dismantled, and on the other hand guiding said pieces and layers during rotation, the edges of each of the said separate pieces, whether linear or curved, having been appropriately rounded, all the separate pieces which form the solid are held together by the six caps of the solid, i.e. the central pieces of each face of the final solid, said caps being either non-visible or visible to the user, each cap having a suitable cylindrical hole, coaxial with the semi-axes of the Cartesian coordinate system, one supporting screw, optionally surrounded by a suitable spring, passing through each of said cylindrical holes, said holes, when the cap is visible to the user, being covered with a flat plastic piece after being steadily screwed to the corresponding cylindrical legs of the non-visible central three-dimensional solid supporting cross, said cross supporting the cube and being located at the centre of the logic toy's solid

2. The cubic logic toy, according to claim 1, said toy's final solid having a cubic shape, with N=2 visible layers per direction plus one more layer, the intermediate layer per direction, non-visible to the user, said toy

being characterised by the fact that

for the configuration of the internal surfaces of its smaller separate pieces, apart from the required planar and spherical surfaces, one cone (κ=1) per semi-axis of the aforementioned three-dimensional, rectangular, Cartesian coordinate system is used, said toy consisting, apart from the non-visible, central, three-dimensional solid supporting cross, of twenty six

(26) more separate pieces, eight (8) of which are visible, whereas the other eighteen (18) are non-visible to the user.

3. The cubic logic toy, according to claim 1, said toy's final solid having a cubic shape, with N=3 visible layers per direction, said toy

being characterised by the fact that

for the configuration of the internal surfaces of its smaller, separate pieces, apart from the required planar and spherical surfaces, one cone (κ=1) per semi-axis of the aforementioned three-dimensional, rectangular, Cartesian coordinate system is used, said toy consisting, apart from the non-visible, central, three-dimensional solid supporting cross, of twenty six (26) more separate pieces, which are all visible to the toy user.

4. The cubic logic toy, according to claim 1, said toy's final solid having a cubic shape, with N=4 visible layers per direction, plus one more layer, the intermediate layer per direction, non-visible to the user, said toy

being characterised by the fact that

for the configuration of the internal surfaces of its smaller, separate pieces, apart from the required planar and spherical surfaces, two cones (κ=2) per semi-axis of the aforementioned three-dimensional, rectangular, Cartesian coordinate system are used, said toy consisting, apart from the non-visible, central, three-dimensional solid supporting cross, of ninety eight (98) more separate pieces, fifty six (56) of which are visible, whereas the other forty two (42) are non-visible to the user.

5. The cubic logic toy, according to claim 1, said toy's final solid having a cubic shape, with N=5 visible layers per direction, said toy

being characterised by the fact that

for the configuration of the internal surfaces of its smaller, separate pieces, apart from the required planar and spherical surfaces, two cones (k=2) per semi-axis of the aforementioned three-dimensional, rectangular, Cartesian coordinate system are used, said toy consisting, apart from the non-visible, central, three-dimensional solid supporting cross, of ninety eight (98) more separate pieces, which are all visible to the toy user.

6. The cubic logic toy, according to claim 1, said toy's final solid having a cubic shape, with N=6 visible layers per direction plus one more layer, the intermediate layer per direction, which is not visible to the user, said toy

being characterized by the fact that

for the configuration of the internal surfaces of its smaller separate pieces, apart from the required planar and spherical surfaces, three cones (k=3) per semi-axis of the

aforementioned three-dimensional, rectangular, Cartesian coordinate system are used, said toy consisting, apart from the non-visible, central, three-dimensional solid supporting cross, of two hundred and eighteen (218) more separate pieces, a hundred and fifty two (152) of which are visible, whereas the other sixty six (66) pieces are non-visible to the toy user.

7. The cubic logic toy, according to claim 1, said toy's final solid having a **substantially** cubic shape, its faces consisting of parts of spherical surfaces of long radius, with N=6 visible layers per direction plus one more layer, the intermediate layer per direction, which is non-visible to the user, said toy

being characterized by the fact that

for the configuration of the internal surfaces of its smaller separate pieces, apart from the required planar and spherical surfaces, three cones ($\kappa = 3$) per semi-axis of the aforementioned three-dimensional, rectangular, Cartesian coordinate system are used, said toy consisting, apart from the non-visible, central, three-dimensional solid supporting cross, of two hundred and eighteen (218) more separate pieces, a hundred and fifty two (152) of which are visible, whereas the other sixty six (66) pieces are non-visible to the toy user.

8. The cubic logic toy, according to claim 1, said toy's final solid having a **substantially** cubic shape, its faces consisting of parts of spherical surfaces of long radius, with N=7 visible layers per direction, said toy

being characterized by the fact that

for the configuration of the internal surfaces of its smaller separate pieces, apart from the required planar and spherical surfaces, three cones ($\kappa = 3$) per semi-axis of the aforementioned three-dimensional, rectangular, Cartesian coordinate system are used, said toy consisting, apart from the non-visible, central, three-dimensional solid supporting cross, of two hundred and eighteen (218) more pieces, which are all visible to the toy user.

9. The cubic logic toy, according to claim 1, said toy's final solid having a **substantially** cubic shape, its faces consisting of parts of spherical surfaces of long radius, with N=8 visible layers per direction, plus one more layer, the intermediate layer per direction, which is non-visible to the user, said toy

being characterized by the fact that

for the configuration of the internal surfaces of its smaller, separate pieces, apart from the required planar and spherical surfaces, four cones ($\kappa = 4$) per semi-axis of the aforementioned three-dimensional, rectangular, Cartesian coordinate system are used, said toy consisting, apart from the non-visible, central, three-dimensional solid supporting cross,

of three hundred and eighty six (386) more pieces, two hundred and ninety six (296) of which are visible, whereas the other ninety (90) pieces are non-visible to the toy user.

10. The cubic logic toy, according to claim 1, said toy's final solid having a **substantially** cubic shape, its faces consisting of parts of spherical surfaces of long radius, with N=9 visible layers per direction, said toy

being characterized by the fact that

for the configuration of the internal surfaces of its smaller, separate pieces, apart from the required planar and spherical surfaces, four cones ($\kappa = 4$) per semi-axis of the aforementioned three-dimensional, rectangular, Cartesian coordinate system are used, said toy consisting, apart from the non-visible, central, three-dimensional solid supporting cross, of three hundred and eighty six (386) more pieces, which are all visible to the toy user.

11. The cubic logic toy, according to claim 1, said toy's final solid having a **substantially** cubic shape, its faces consisting of parts of spherical surfaces of long radius, with N=10 visible layers per direction, plus one more layer, the intermediate layer per direction, which is non-visible to the user, said toy

being characterized by the fact that

for the configuration of the internal surfaces of its smaller separate pieces, apart from the required planar and spherical surfaces, five cones ($\kappa = 5$) per semi-axis of the aforementioned three-dimensional, rectangular, Cartesian coordinate system are used, said toy consisting, apart from the non-visible, central, three-dimensional solid supporting cross, of six hundred and two (602) pieces, four hundred and eighty eight (488) of which are visible, whereas the other one hundred and fourteen (114) pieces are non-visible to the toy user.

12. The cubic logic toy, according to claim 1, said toy's final solid having a **substantially** cubic shape, its faces consisting of parts of spherical surfaces of long radius, with N=11 visible layers per direction, said toy

being characterized by the fact that

for the configuration of the internal surfaces of its smaller separate pieces, apart from the required planar and spherical surfaces, five cones ($\kappa = 5$) per semi-axis of the aforementioned three-dimensional, rectangular, Cartesian coordinate system are used, said toy consisting, apart from the non-visible, central, three-dimensional solid supporting cross, of six hundred and two (602) more separate pieces, which are all visible to the toy user.